visible" by Lord Crawford (then Lord Lindsay), Mr. J. G. Lohse, and the writer. There is also a record of *two* bright lines having been seen by me on October 28, 1877, one of which was "well seen" about the place of F, the other being referred to about 477^{mmm} of wave-length, and described as "another bright line" without further remark. No mention is made of C on this occasion. At present, however, January 11, 1887, C is extremely bright; and as it was not visible at Bothkamp on June 18, 1872, although the red end of the spectrum was specially examined and the position of the bright F determined, there cannot be the slightest doubt as to the variability of the spectrum, as pointed out by M. von Gothard several years ago.

It is very remarkable that the C line is obviously more variable than F* in the spectrum of this most interesting star; this must necessarily involve a certain amount of colour change, which may partly explain the very conflicting evidence respecting the star's variability.

Lord Crawford's Observatory,
  Dun Echt: Jan. 12, 1887.

Spectroscopic Observations of the Motion of Stars in the Line of Sight, made at the Temple Observatory, Rugby. By Geo. M. Seabroke.

In the year 1879 I brought before the notice of the Society some, perhaps rather premature, results of my spectroscopic observations of the motions of stars towards or away from our system. Since that time I have been engaged, whenever a sufficiently long period without interruption could be obtained, in continuing this line of research.

A large number of my observations have been made with a view to perfecting instrumental arrangements, and being, of course, otherwise valueless, are not recorded.

The following arrangement appears at present to be satisfactory, and with it the results detailed below have been obtained.

The telescope is a silver-on-glass Newtonian Reflector of $12\frac{1}{8}$ inches aperture, and 6 feet 6 inches in focal length, equatorially mounted. The spectroscope has a collimator of a focal length of 12 inches and $\frac{3}{4}$-inch aperture, and a Barlow lens in the telescope elongates the cone of rays to fit the same; a cylindrical lens is also used to give sufficient width of spectrum. The prisms are used twice, the rays of light passing first through the lower portions, and back through the upper portions to the observing

---

* The variability of the F-line was, however, remarked at Greenwich, on September 4, 1884, and may be generally inferred from its varying appearance on several other occasions.

telescope of 1 foot focal length, carrying an eyepiece which magnifies the slit about 15 times. The number of prisms used is equivalent to either 3 or 5 of 60°.

For comparison of the positions of the lines observed, I use a spot of light, or "ghost," produced by the reflection from the surface of the last prism of the rays of light proceeding from a minute slit carried by a micrometer, after passing through a collimating lens. The slit in question is illuminated by rays from a lamp carried on the large telescope, reflected from a silvered glass attached to the micrometer; the light is passed through a glass of a colour as near as possible that of the part of the spectrum under examination, so as to avoid want of focal coincidence.

The vacuum tube, or magnesium wire, is carried in front of the slit, and can be moved to and from that position at pleasure.

To compare the lines, the slit of the spectroscope is illuminated by the star and comparison lights alternately, and a reading of position of each taken with the ghost. The value of the divisions of the micrometer screw are ascertained by measurement of known lines on the solar spectrum.

For these observations the telescope at my disposal is very small, and therefore it is only the spectrum of the brighter stars that I am able to attack. There is a fine field in this line of research open to the possessors of large telescopes giving good definition.

In the following list of measures the sign + means that the star is receding from, and − approaching, our system. The corrected motion is the apparent value corrected for the orbital motion of the earth.

Number of Prisms.	Line Compared.	Number of Measures.	Cor. Motion in Miles per Second.	Date 1800+	Remarks.
			α Andromedæ.		
5	F	6	− 22·5	85·87	
5	F	4	− 29·2	·90	
			γ Pegasi.		
5	F	5	+ 13·6	85·87	Very difficult.
5	F	4	− 66·8	·90	
			α Aurigæ.		
5	F	2	− 41·5	86·27	Doubtful.
5	F	5	+ 15·1	·32	
5	F	3	+ 8·0	·33	
5	F	3	+ 8·5	·34	
			γ Geminorum.		
5	F	3	− 46·3	85·19	

Number of Prisms.	Line Compared.	Number of Measures.	Cor. Motion in Miles per Second.	Date 1800+	Remarks.
			Sirius.		
5	F	4	−31·72	86·12	
5	F	9	−43·6	·16	
5	F	7	−49·5	·17	
			Castor.		
7	F	3	+19·6	82·30	
			Procyon.		
7	F	5	+15·8	85·19	
5	F	6	+7·5	86·17	
			Pollux.		
7	F	2	−34·4		
			α Leonis.		
7	F	5	+32·1	82·30	
7	F	3	+34·0	·35	
5	F	4	−0·1	85·35	
5	f	3	−3·5	86·33	
5	F	4	+52·5	·40	
			γ Leonis.		
5	F	2	+12·2	79·33	
7	F	3	+23·2	82·35	
7	F	2	−48·5	·36	
5	F	4	+7·2	85·35	
5	F	2	+21·3	·41	
5	F	2	−31·5	86·34	
5	F	2	−31·5	·40	
			α Ursæ Maj.		
5	F	3	−0·5	85·42	
5	F	4	−11·2	86·42	
5	F	2	+22	·49	
5	F	3	+21·5	·54	
			γ Ursæ Maj.		
5	F	3	−24·9	85·42	
5	F	4	−6·5	86·40	
5	F	4	−24·9	·49	

H

Number of Prisms.	Line Compared.	Number of Measures.	Cor. Motion in Miles per Second.	Date 1800+	Remarks.
			β Ursæ Maj.		
5	F	5	−58·7	85·42	
5	F	3	+11·6	86·49	
5	F	3	−50·0	·49	Very doubtful.
5	F	4	+27·2	·54	Line wide.
			δ Leonis.		
7	F	5	−42·4	82·36	
7	F	5	+39·0	·36	
5	F	7	−44·5	85·35	
5	F	4	−47·0	·41	
5	F	3	+32·0	86·40	
5	F	4	+ 7·0	·40	
			θ Leonis.		
7	F	4	+21·5	82·36	
7	F	8	+33·8	·36	
5	F	4	+ 8·2	85·35	
5	F	5	+43·3	·41	
5	F	4	+32·5	86·40	
5	F	4	−31·5	·40	
			β Leonis.		
5	F	4	+14·5	85·35	
5	F	5	+23·8	·41	
5	F	4	−53·0	86·34	
5	F	3	+ 5·0	·40	
5	F	3	−24·5	·40	
			δ Ursæ Maj.		
5	F	3	−31·6	85·42	
5	F	2	−16·4	·48	
5	F	3	+20·4	86·49	
5	F	1	+36·0	·54	
			ζ Virginis.		
5	F	1	−43·0	85·41	Doubtful.
			ε Ursæ Maj.		
5	F	3	−29·3	85·41	
5	F	6	−61·3	·48	
5	F	9	−52·2	86·49	
5	F	6	−69·9	·50	

Number of Prisms.	Line Compared.	Number of Measures.	Cor. Motion in Miles per Second.	Date 1800+	Remarks.
			ζ *Ursæ Maj.*		
5	F	3	− 23·5	85·41	
5	F	3	− 48·0	·45	
5	F	5	÷ 20·1	·48	
5	F	4	÷ 14·4	86·50	
5	F	4	− 2·6	·54	
5	F	3	− 10·4	·64	
5	F	3	+ 29·5	·66	
5	F	5	÷ 25·0	·69	
5	F	2	+ 15·5	·70	
			α *Virginis.*		
7	F	7	÷ 16·9	82·36	Difficult.
7	F	7	+ 13·5	·36	
5	F	7	+ 3·7	85·41	
5	F	4	+ 43·2	·41	
			η *Bootis.*		
7	F	6	+ 5·9	82·37	
5	F	3	− 40·1	86·50	
5	F	5	− 8·5	·54	
			η *Ursæ Maj.*		
5	F	5	+ 25·0	86·50	
5	F	5	− 11·1	·54	
5	F	5	+ 10·0	·64	
5	F	4	+ 8·6	·66	
5	F	7	+ 26·5	·69	
5	F	3	+ 24·0	·70	
5	F	3	+ 18·9	·70	
			Arcturus.		
7	F	4	+ 24·1	82·37	
5	F	5	+ 13·2	85·41	
5	F	3	− 76·6	·44	
5	F	5	− 24·1	·45	
5	F	3	− 44·1	·48	
5	F	4	− 18·2	·48	
5	F	3	+ 14·6	·51	
5	F	4	− 40·1	·55	

H 2

Number of Prisms.	Line Compared.	Number of Measures.	Cor. Motion in Miles per Second.	Date 1800+	Remarks.
			Arcturus.		
5	F	3	+ 3·0	86·49	
5	F	4	−43·0	·64	
5	F	3	−29·0	·66	
5	F	2	−36·0	·69	
			ε Bootis.		
5	F	4	−16·7	85·55	
5	F	3	−29·3	86·50	
5	F	1	+ 8·0	·66	
5	F	3	+ 2·0	·69	
5	F	4	−36·4	·74	
			α Coronæ Bor.		
5	F	3	−36·5	86·64	
5	F	3	+13·9	·64	
5	F	1	−33·0	·66	
5	F	3	−45·0	·69	
5	F	4	−27·5	·70	
			α Ophiuchi.		
5	F	4	−21·3	85·51	
5	F	4	−55·4	·75	
5	F	5	− 1·4	86·64	
5	F	4	−23·1	·66	
5	F	2	+ 7·0	·69	
5	F	2	−24·5	·69	
			Vega.		
7	F	3	−65	81·53	
7	F	3	−45·9	·73	
5	F	2	−28·9	85·48	
5	F	4	−59·2	·50	
5	F	8	−43·3	·71	
5	F	3	−49·2	·74	
5	F	2	−41·5	86·69	
5	F	3	−32·4	·70	
5	F	4	−32·9	·72	

Number of Prisms.	Line Compared.	Number of Measures.	Cor. Motion in Miles per Second.	Date 1800+	Remarks.
			γ Lyræ.		
5	F	4	+ 11·5	86·74	Very faint.
3	F	6	− 44·6	·75	
3	F	4	− 35·7	·87	
3	F	2	− 66·0	·88	
			ζ Aquilæ.		
5	F	10	− 29·5	85·75	
5	F	4	− 177·3	·78	
5	F	5	− 30·0	86·72	
3	F	5	+ 14·0	·75	
			γ Aquilæ.		
5	F		− 31·9	86·72	
3	F		+ 34·4	·75	
3	F	est.	− 30·0	·87	
			δ Cygni.		
7	F	2	− 26·5	81·74	
7	F	3	− 55·6	·79	
5	F	6	+ 24·6	85·72	
5	F	4	− 5·8	·75	
5	F	4	− 15·7	·75	
5	F	4	+ 38·1	·78	
5	F	2	− 36 9	·87	
3	F	5	− 63·5	86·80	
3	F	4	− 50·7	·88	
3	F	3	− 50·2	·91	
			Altair.		
5	F	3	+ 22·7	84·70	
5	F	4	− 38·6	·77	
5	F	2	− 43·6	85·74	
5	F	4	+ 6·0	·75	
5	F	7	− 19·4	·75	
5	F	5	− 25·1	·78	
5	F	3	− 22·0	86·64	
5	F	7	− 0·4	·72	
5	F	4	− 2·8	·74	
3	F	4	− 70·0	·88	

Number of Prisms.	Line Compared.	Number of Measures.	Cor. Motion in Miles per Second.	Date 1800+	Remarks.
			γ Cygni.		
7	F	5	−68·0	81·79	
5	F	4	−46·3	85·75	
5	F	5	+33·2	·90	
3	F	4	−57·0	86·80	
3	F	3	−57·5	·88	
3	F	3	−66·0	·91	
			α Cygni.		
7	F	2	+31·0	81·73	
7	F	3	−32·8	·78	
7	F	3	+29·9	·79	
7	F	7	−35·5	·79	
5	F	6	−22·5	86·69	
5	F	3	+18·5	·69	
3	F	5	−34·0	·80	
3	F	5	−18·6	·91	
			ε Cygni.		
7	F	2	−53·4	81·79	Uncertain.
5	F	4	−21·7	85·87	
3	F	2	−63·0	86·80	
3	F	1	−59·0	·91	
			η Pegasi.		
5	F	4	−54·4	85·8	
			α Pegasi.		
6	F	4	− 0·2	80·88	
7	F	2	−39·5	81·79	
5	F	4	−44·6	85·87	
5	F	6	−41·6	·87	
5	F	5	−21·9	·90	
			β Pegasi.		
5	F	1	+ 1·8	85·87	

Spectroscopic Results for the Motions of Stars in the Line of Sight, obtained at the Royal Observatory, Greenwich, in the year 1886. **No. X.**

(*Communicated by the Astronomer Royal.*)

The results here given are in continuation of those printed in the *Monthly Notices*, vol. xxxvi. p. 318, vol. xxxvii. p. 22, vol. xxxviii. p. 493, vol. xli. p. 109, vol. xlii. p. 230, vol. xliii. p. 81, vol. xliv. p. 89, vol. xlv. p. 330, and vol. xlvi. p. 126. The observations were made with the "half-prism" spectroscope, one "half-prism" with a dispersion of about $18\frac{1}{2}°$ from A to H being used throughout. Eyepieces with magnifying powers of 14 and 22 respectively were employed.

The cylindrical lens has always been used in front of the slit as in the observations made previously to 1881. The observations of the Moon and of the sky have been made as a check on the general accuracy of the results.

The day specified in the first column is the Civil Day, and the hour is that of Greenwich Civil Time, commencing at Greenwich Mean Midnight, and reckoning from 0 to 24 hours.

Motions of Stars in the Line of Sight, in Miles per Second, observed with the Half-prism Spectroscope.

(+ denotes Recession ; − Approach.)

The initials M., N., and L. are those of Mr. Maunder, Mr. Nash, and Mr. Lewis respectively.

Date. 1886.	Obs.	No. of Meas.	Line.	Earth's Motion in miles per sec.	Concluded Motion of Star. Meas.	Concluded Motion of Star. Estimd.	Remarks.
				α Andromedæ.			
Jan. 27 19ʰ	M	2	F	+ 15·4	− 26·4	− 23·6	Spectrum fairly steady.
Feb. 1 19	M	2	F	+ 14·7	− 75·3	− 44·2	Definition poor.
Nov. 5 23	M	2	F	+ 8·6	(− 2·0)	(+ 2·5)	Spectroscope out of adjustment.
				γ Pegasi.			
Feb. 1 19	M	2	F	+ 15·0	− 6·5	− 5·7	Definition bad; star-line seen with great difficulty.
				β Arietis.			
Feb. 1 19	M	2	F	+ 18·4	− 85·4	− 45·5	Definition very bad.
Dec. 4 21	M	4	F	+ 12·1	+ 12·4	+ 11·8	Definition good.
				β Persei.			
Jan. 27 20	M	2	F	+ 16·8	− 50·2	− 46·4	Definition fair.
Feb. 1 20	M	2	F	+ 17·1	− 28·6	− 30·7	Wind high but definition fair.